

# Functional Decline Predicts Emergency Department Use in Veterans With Dementia

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## Abstract

**Background:** We examined emergency room (ER) utilization by persons with dementia (PWDs) using caregiver and patient characteristics as predictors. **Methods:** A secondary analysis of 296 veteran–caregiver dyads. Caregivers recorded PWD baseline characteristics and noted ER visits over the next year. Two sets of regression models analyzed categorical ER use and repeat ER use. **Results:** In the univariate analysis, categorical use of the ER was predicted by patients' functional status ( $P \leq .008$ ) and Veterans Affairs priority grouping ( $P \leq .02$ ). Repeat ER admissions were predicted by functional status ( $P \leq .04$ ), number of chronic conditions ( $P \leq .01$ ), and caregiver-reported relationship strain ( $P \leq .04$ ). In multivariate analysis, categorical ER use was predicted by functional status ( $P \leq .02$ ), priority grouping ( $P \leq .03$ ), and number of chronic conditions ( $P \leq .06$ ). **Conclusions:** Functional status most strongly predicted ER use, highlighting the promise of home-based interventions to improve activities of daily living. Number of chronic conditions and caregiver-reported relationship strain are potential targets of intervention during discharge process.

## Keywords

dementia, health services research, activities of daily living, medical services, emergency

## Introduction

Even when necessary, emergency room (ER) use is a suboptimal resource to address the needs of elderly adults, especially those with dementia. Adults older than 65 years are responsible for about 15% to 25% of ER visits,<sup>1,2</sup> and this proportion will increase as the US population ages. Elderly people have higher rates of ER utilization, longer stays in the ER, and more urgent reasons for their visits; and they are more likely to have repeat ER uses.<sup>3,4</sup> Unfortunately, the ER is one of the most costly sources of care: indeed, the Medical Expenditure Panel Survey estimates that the average amount paid for a nonemergency visit to the ER is 7 to 10 times more than a visit to a health center.<sup>5</sup>

Furthermore, the episodic nature of ER care cannot sufficiently treat the complicated and interrelated medical, functional, and social needs of the elderly.<sup>3</sup> Other contributing factors that result in subpar care for the elderly in the ER include atypical disease presentations, multiple comorbidities, and polypharmacy.<sup>3,6</sup> The ER staff themselves feel inadequately trained in geriatrics and in meeting the needs of older people.<sup>7-9</sup>

Along with the increase in the number of older adults is an associated increase in patients with dementia (PWDs). Dementia is associated with both increased general health service use and ER use—PWDs have almost twice as many ER visits as their counterparts without dementia, and ER costs are 2.5 times

higher than costs of their counterparts.<sup>10</sup> As dementia becomes an increasingly important public health problem, it will become imperative to render health service use more efficient.

The use of the ER for PWDs is particularly problematic for several reasons. Care for PWDs is more complex because PWDs tend to be taking more medications and having more numerous and serious medical problems than persons without

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dementia, and accurate history taking generally requires corroboration from caregivers who are often not readily available in the ER.<sup>11-13</sup> Moreover, the ER itself is an unfamiliar and overstimulating environment (eg, high background noise, many unfamiliar people, and fast pace), and these characteristics are known to contribute to confusion, aggression, and catastrophic reactions in PWDs.<sup>11</sup> Our study, thus, hopes to elucidate what characteristics of patient-caregiver dyads can help predict ER use; as these characteristics may be targets for proactive interventions that can reduce ER use. Even if these predictive characteristics may themselves be immutable, the ability to profile the type of PWD likely to use the ER may help the clinician preemptively connect the PWD with resources before the need for ER use arises.

Conceptually, this study follows Andersen's health service model, one of the most frequently used frameworks to analyze factors associated with health care utilization. Andersen's model groups predictive factors of health service utilization into 3 categories, which include both individual and contextual factors: predisposing, enabling, and need factors. Systematic reviews of older adults' ER visits have reported that need-related factors are the most important class of predictors.<sup>14</sup> Although there have been a number of studies examining older adults' ER utilization, there are far fewer that investigate the subpopulation of those with dementia. Those that do exist have studied very specialized populations (eg, PWDs with feeding tubes<sup>15</sup> or with dysphagia<sup>16</sup>) Another unique aspect of our study is the inclusion of caregiver characteristics as predictors of ER utilization. Caregivers are often the primary decision makers as to whether PWDs need to go to the ER and, thus, investigation of the influence of their characteristics on ER utilization is an important gap in the literature we are addressing.

In sum, the objective of this study is to identify risk factors for utilization of the ER by PWDs. We will investigate this issue by assessing characteristics of patients and caregivers.

## Methods

### Sample

Data for this study were obtained from 296 veterans with dementia and their caregivers. This represents a subpopulation of veterans and their caregivers who were originally enrolled in a clinical trial evaluating "Partners in Dementia Care," a care-coordination intervention in 5 veteran hospitals (Boston, MA [intervention site]; Houston, TX [intervention site]; Providence, RI [control site]; Beaumont, TX [control site]; and Oklahoma City, OK [control site]). For "Partners in Dementia Care," veterans were recruited over a 2.5-year period (February 2007-July 2009) and eligible if they were older than 50 years with a diagnosis of dementia, received primary care from the Veterans Affairs (VA), and lived outside an institution. Caregivers were included if they were unpaid family members or friends who provided the most assistance with personal care, activities of daily living (ADLs) such as bathing and dressing, and health-related decisions. Our study sample took

the "Partners in Dementia Care" population and excluded patient-caregiver dyads if there was less than 1 year's worth of data or if any data were missing. This left 296 dyads with complete information for this study.

### Measures

Primary outcome measures were 2-fold: categorical ER use (ie, whether the veteran used the ER over the 12 months following the interview) and, if the veteran did use the ER, the number of ER visits during that 12-month period. The ER use represented both VA and non-VA services use. The VA ER use data came from administrative records covering the 12-month study period, obtained from the VA National Patient Care Database SE data files maintained at the Austin Automation Center. Data for non-VA ER use came from self-reports provided as part of the interviews.<sup>17</sup> Briefly, patient caregivers were asked to complete a structured telephone interview at study baseline.

### Predictive Factors

All factors controlled for variation by VA site and, therefore, intervention. They were categorized, based on the Andersen model, into 3 categories: predisposing, enabling, and need factors.

**Predisposing factors.** Patient and caregiver sociodemographics (eg, age, race, education, and gender) and social resources (eg, the number of family and friends who helped the caregiver take care of the veteran) are provided in Table 1.

**Enabling factors.** Resources that facilitate or hinder a patient's access to service (income, proximity to ER, and enrollment priority) are provided in Table 2. Enrollment priority reflects a veteran's disability related to his or her military service and/or his level of financial need. As such, priority groups contain information about both need and access (the higher-priority groups are likely to have more service needs as well as fewer financial barriers to VA access). Priority groups range from 1 to 8, with 1 being the highest priority for enrollment. We grouped VA enrollees into 3 sets of priority levels that broadly differentiated copayment levels and out-of-pocket maximums.<sup>18</sup> Consequently, for the purposes of these analyses, we grouped priority level with the enabling factors. The groupings used were priority level 1 (the lowest copayment levels), levels 2 to 6 (mixed copayment levels), and levels 7 and greater (the highest copayment for services).

**Need factors.** Table 3 consists of both caregiver and patient characteristics; factors included perceived need and urgency, level of distress, and presence of psychiatric comorbidity. Patients' need factors were based on caregiver ratings of the veteran's personal care dependency, cognitive impairment, behavior problems, and number of chronic conditions. The personal care composite is a 6-item measure of personal care dependency, as measured by ability to do ADLs, for example, bathing, dressing, grooming, toileting, eating, and moving

**Table 1.** Predisposing Factors.

	Categorical ER Use					Repeat ER Use		
	No ER Visit, N = 130	ER Visit, N = 166	OR	CI	P Value	OR	CI	P Value
<b>Patient</b>								
Age (mean, std)	78.3 (8.5)	78.8 (7.7)	1.005	(0.977-1.035)	.719	0.0041	(-.0101-0.0183)	.571
Race (n, %)								
Other	112 (86.2)	142 (85.5)	1.642	(0.800-3.370)	.176	0.2528	(-.0889-0.5945)	.147
White	18 (13.9)	24 (14.5)						
Education (n, %)								
≤High school	69 (53.1)	79 (47.6)	0.835	(0.521-1.138)	.453	0.1121	(-.2333-0.2060)	.903
GTHS	61 (46.9)	87 (52.4)						
Marital (n, %)								
Married	98 (75.4)	131 (78.9)	0.859	(0.487-1.516)	.601	0.0097	(-.2575-0.2770)	.943
Not married	32 (24.6)	35 (21.1)						
Gender (n, %)								
Male	129 (99.2)	161 (97.0)	3.703	(0.415-33.021)	.241	-0.137	(-.2333-0.2060)	.903
Female	1 (0.8)	5 (3.0)						
<b>Caregiver</b>								
Age (mean, std)	68.7 (12.3)	69.0 (12.0)	0.998	(0.978-1.017)	.814	0.0013	(-0.0079-0.0105)	.776
Race (n, %)								
White	110 (84.6)	137 (82.5)	1.760	(0.893-3.468)	.102	0.1388	(-0.1824-0.4599)	.397
Other	20 (15.4)	29 (17.5)						
Education (n, %)								
≤High school	48 (36.9)	67 (40.4)	1.075	(0.660-1.749)	.772	-0.0551	(-.2762-0.1659)	.625
High School graduate	82 (63.1)	99 (59.6)						
Cg relationship to patient (n, %)			0.929	(0.542-1.592)	.643	-0.0182	(-0.2709-0.2344)	.888
Marital status								
Wife	94 (72.3)	124 (74.6)	0.929	(0.542-1.592)	.789	-0.0182	(-0.2709-0.2344)	.888
Other	36 (27.7)	42 (25.3)						
Gender (n, %)								
Male	4 (3.1)	7 (4.2)	1.559	(0.435-5.588)	.496	0.0185	(-0.5044-0.5414)	.945
Female	126 (96.9)	159 (95.8)						
# Family/friend helpers (mean, std)	4.6 (3.7)	4.8 (4.4)	1.006	(0.949-1.067)	.831	-0.0184	(-0.0447-0.0080)	.172

Abbreviations: ER, emergency room; CI, confidence interval; std, standard; cg, caregiver; GTHS, greater than high school.

**Table 2.** Enabling Factors.

	Categorical ER Use					Repeat ER Visits		
	No ER Visit, N = 130	ER Visit, N = 166	OR	CI	P Value	OR	CI	P Value
<b>Income</b>								
US\$ 0-20 000	30 (23.1)	39 (23.5)	1.014	(0.543-1.893)	.781	-0.1704	(-0.4660-.1252)	.342
US\$ 20 001-40 000	54 (41.5)	63 (38.0)	0.845	(0.491-1.457)		0.0526	(-0.1938-.2989)	
US\$ 40 001+	46 (35.4)	64 (38.5)						
Proximity to ER-miles, mean (std)	19.1 (17.6)	20.6 (29.6)	1.003	(0.993-1.013)	.542	-0.0016	(0.006-0.003)	.457
<b>Enrollment priority</b>								
Priority 1	8 (6.15)	24 (14.5)	0.306	(0.128-0.730)	.018	-0.0321	(.3072-0.2430)	.226
Priority 2, 3, 4, 5, 6	85 (65.4)	86 (51.8)	0.454	(0.181-1.142)		-0.2180	(0.4681-0.321)	
Priority 7a,7c, 8a, 8c	37 (28.5)	56 (33.7)						

Abbreviations: ER, emergency room; CI, confidence interval; std, standard.

around the home; it has a Cronbach's  $\alpha$  of 0.87.<sup>19</sup> Cognitive impairment is a 7-measure composite that rates the difficulty with which patients track current events; are oriented to day of the week; repeat things, pay attention; and remember addresses, people, and appointments; it has a Cronbach's  $\alpha$  of

0.82.<sup>19</sup> Behavior problems is a 4-item measure of some of the patient's neuropsychiatric symptoms and includes the frequency with which he or she complains or criticizes, interferes with family members, yells or swears, and becomes agitated; it has a Cronbach's  $\alpha$  of .79.<sup>19</sup>

**Table 3.** Need Factors.

	Categorical ER Use					Repeat ER Visits		
	No ER Visit, N = 130	ER Visit, N = 166	OR	CI	P Value	OR	CI	P Value
<b>Patient</b>								
Personal care composite (mean, std)	2.3 (3.0)	3.1 (3.4)	1.112	(1.028-1.203)	.008	0.033	(0.002-0.064)	.039
Cognitive impairment composite (mean, std)	6.9 (3.6)	6.7 (3.7)	0.995	(0.933-1.062)	.890	0.004	(-0.026-0.033)	.805
Behavior problems composite (mean, std)	2.7 (2.6)	2.6 (2.6)	1.014	(0.924-1.112)	.770	0.039	(-0.0015-0.0796)	.059
# Chronic conditions, (mean, std)	4.7 (2.2)	4.6 (2.3)	0.991	(0.891-1.102)	.861	0.060	(0.0127-0.106)	.013
<b>Caregiver</b>								
Role captivity composite (mean, std)	3.7 (1.5)	3.6 (1.5)	0.975	(0.832-1.144)	.759	0.0041	(-0.070-0.0780)	.914
Depression (mean, std)	2.6 (2.4)	2.7 (2.6)	0.996	(0.930-1.067)	.917	-0.0022	(-0.034-0.030)	.892
Relationship strain (mean, std)	4.3 (3.4)	4.2 (3.4)	0.987	(0.889-1.094)	.798	0.0539	(0.002-0.106)	.044
Physical health strain (mean, std)	3.7 (1.4)	3.6 (1.5)	1.001	(0.851-1.177)	.994	0.0452	(-0.027-0.117)	.220

Abbreviations: ER, emergency room; CI, confidence interval; std, standard.

Caregivers' need factors were based on caregivers' reports of their own care-related role captivity, relationship strain with the veteran, and physical health strain.<sup>11,17,19</sup> A general measure of caregiver depression is also included, which is not specifically tied to consequences of caregiving.

Role captivity was a 3-measure composite of the degree to which the caregiver feels trapped in caring for the veteran and the desire to escape the situation.<sup>20</sup> It had a Cronbach's  $\alpha$  of 0.80.<sup>21</sup> Physical health strain was a 3-item measure of whether the caregiver felt that his or her physical health was worse, whether the caregiver was ill more frequently and whether the caregiver was bothered more frequently by aches and pains because of the caregiving; it had a Cronbach's  $\alpha$  of 0.83.<sup>19</sup> Relationship strain was a 6-item measure of whether caregivers, as a result of their caregiving, felt closer to the veteran, were appreciated by the veteran, got pleasure from helping, felt the relationship was strained, were angry toward the veteran, and/or felt the veteran manipulated them. It had a Cronbach's  $\alpha$  of .78.<sup>19</sup> Depression was a 10-item measure of general well-being, using the Center for Epidemiologic Studies Depression Scale. A score of 4 or greater indicated a high risk of clinical depression. It had a Cronbach's  $\alpha$  of .78.<sup>19</sup>

### Statistical Analysis

We performed 2 sets of regression models. First, we conducted a set of logistic regressions to assess the association of the predisposing, enabling, and need factors on our dichotomous outcome variable of "Any ER Visits" versus "No ER Visits" for each patient. Second, we used negative binomial regressions to assess the association of these factors with the number of ER visits among patients with at least 1 ER visit. For each set of regressions, we first assessed the relationship of each predisposing, enabling, or need factor individually with our binary or count outcome (the individual-level analyses). We then estimated multivariable regressions incorporating those patient and caregiver characteristics that had individual associations with the outcomes that met the  $P \leq .15$  level of statistical

significance. A criterion of .15 was used to include the broad set of predictors that might contribute to the multivariate model. All models, both individual level and multivariable, controlled for differences among the study sites. In our final multivariable models, variables that were statistically significant predictors at the  $P \leq .05$  level were considered statistically significant, those at the  $P \leq .10$  level considered to be trending toward significance, and those with higher estimated  $P$  values were considered not statistically significant. All variables were retained in the final models.

### Results

Fifty-six percent of the patients ( $n = 166$ ) had 1 or more ER visits. In our sample of 296 veterans, the mean age of the patient was 78.6 (standard deviation [SD] 8.1). Most (98.0%) of the sample was male, 85.8% were white, and 50% had an education less than or equal to high school; whereas the other 50% had graduated from high school or greater, and 77% were married. Overall, our sample showed moderate cognitive impairment (mean cognitive impairment score was 6.8 [SD 3.6]), multiple behavior problems (mean score was 2.6 [SD 2.6]), and extensive personal care dependency (mean score was 2.8 [SD 3.2]), similar to levels of care among nursing home residents.<sup>22</sup> The mean number of chronic conditions was 4.6 (SD 2.3).

Of the 296 caregivers, the mean age was 68.8 (SD 12.1). Most (96.3%) were women; 83.4% were white, 38.9% had an education less than or equal to high school, and the other 61.1% were graduated from high school. Most (73.6%) of the caregivers were married to the PWD. The mean number of helpers for each caregiver was 4.7 (SD 4.1).

Individual-level analyses revealed that none of the predisposing factors (Table 1), such as patient or caregiver race, age, education, gender, as significant for predicting either categorical use of the ER or number of ER admissions. Among the enabling factors (Table 2), such as income, proximity to ER, and enrollment priority, only enrollment priority was significant for predicting either categorical use of the ER

**Table 4.** Multivariate Analysis Full Model.

	Categorical ER Use			Repeat ER Use		
	OR	CI	P value	OR	CI	P value
<b>Patient</b>						
Personal care composite	1.106	(1.022-1.197)	.020	0.0245	(-.0065-0.0556)	.122
Race (n, %)						
Other				0.1526	(-1918-0.4971)	.385
White						
Behavior problems composite				0.0086	(-.0376-0.0549)	.714
# of chronic conditions				0.0464	(-.0020-0.0949)	.060
Enrollment priority						
Priority 1						
Priority 2,3,4,5,6	0.338	(0.140-0.815)	.027			
Priority 7a, 7c, 8a, 8c	0.531	(0.207-1.360)				
<b>Caregiver</b>						
Race (n, %)						
Other						
White	1.598	(0.802-3.187)	.190			
Relationship strain				0.0354	(-0.0210-0.0919)	.218
<b>VA site</b>						
Beaumont vs Houston	1.474	(0.565-3.845)	.0073	-0.3702	(-0.9200-0.1797)	.0481
Boston vs Houston	2.875	(1.513-5.461)		0.2450	(-0.1111-0.4886)	
Oklahoma City vs Houston	1.564	(0.627-3.900)		0.3680	(-0.1900-0.6799)	
Providence vs Houston	2.908	(1.454-5.816)		0.0544	(0.0559-0.6802)	

or number of ER admissions ( $P \leq .02$ ), with the highest priority group (priority 1 enrollees) being the most likely to use ER services.

However, need factors (Table 3) did predict ER utilization. The patient's personal care composite score (ie, ability to perform ADLs) was significant for predicting both categorical use of the ER ( $P \leq .008$ ) and repeat ER admissions ( $P \leq .04$ ). The patient's behavior problems and number of chronic conditions were not significant for predicting categorical use of the ER, but the patient's behavior problems showed a trend associated with increased number of ER admissions ( $P \leq .06$ ); and the patient's number of chronic conditions was predictive of the number of ER admissions ( $P \leq .01$ ). For caregiver need factors, relationship strain was the only significant variable for predicting the number of ER admissions ( $P = .04$ ).

Following from the individual-level analyses, the multivariate logistic model for categorical ER use (yes or no) included patient characteristics (personal care composite, race, and enrolment-priority grouping), and caregiver race and controlled for site. The multivariate negative binomial model for repeat ER visits included the patients' personal care composite, race, behavior problems composite, number of chronic conditions, and the caregiver race and caregiver-related relationship strain (Table 4). Both priority grouping ( $P \leq .03$ ) and the patient's personal care composite were significant ( $P \leq .02$ ) for categorical ER use, with the number of patient's chronic conditions trending toward significance for repeat ER visits ( $P = .06$ ).

Finally, our VA site indicator, which we included in all models to control for site-specific effects on ER use, was significant for categorical VA use ( $P \leq .007$ ) and repeat ER use ( $P \leq .05$ ), with veterans at our 2 northern region sites (an

intervention site and a control site) being the most likely to use ER services.

## Discussion

This study uniquely integrated information about patients and caregivers to predict the use of the ER. It contributes to the current gap in the literature<sup>4</sup> in profiling elderly patients who are at high risk of going to the ER and who might benefit from proactive interventions. Overall, need factors—both patients and caregivers—were predictive of ER utilization as was the veterans' priority level.

The main finding of this study was that personal care dependency is significant for predicting ER utilization. This is consistent with the findings of other studies showing functional status to be a predictor of health care utilization in general—both in the general elderly population<sup>22-26</sup> and in specific diseases such as Parkinson's<sup>26</sup> and stroke<sup>27</sup>—as well as elderly patients' use of the ER.<sup>3,28-38</sup>

Possible reasons why functional dependence is such a strong predictor is that it may reflect a frailty that predisposes an individual to become injured<sup>31</sup> or to fall,<sup>32</sup> which is the most common reason for an elder to use the ER.<sup>4,33,34</sup> Several studies also found that older adults commonly report that a decline in ADLs directly contributes to an ER visit.<sup>35,36</sup> Immobility, in particular, could precipitate a call from an elderly patient for ambulance transport, which would directly take him or her to the ER. This is corroborated by studies that have found that older adults are 2 to 4 times more likely to arrive at the ER by ambulance than younger adults.<sup>3,4</sup>

Another finding of this study was that a patient's number of chronic conditions was a significant risk factor for repeat ER utilization. The association between comorbid medical conditions and increased health care utilization is consistent with findings of other studies of elderly populations<sup>22,26</sup> Comorbid conditions logically covary with a patient's ability to perform ADLs, which likely explains the relationship, given comorbid conditions are not significant in the multivariate analysis. Moreover, PWDs are especially at risk because they tend to have more serious medical comorbidities than their counterparts without dementia<sup>12</sup> and, even when PWDs have the same comorbidities as their cohorts, they have poorer functional and nutritional status.<sup>37</sup>

The third patient need-related factor associated with ER utilization was the patient's behavior problems, which includes neuropsychiatric symptoms; these trended toward significance in explaining repeat ER admissions. This is consistent with findings of other studies of PWD that behavior problems and neuropsychiatric symptoms in PWD dramatically increase health care costs and utilization (including hospital and physician visits).<sup>38-40</sup> Possible explanations are that the constant physical and emotional duress a caregiver experiences as a result of behavior problems contribute to higher relationship strain (a significant predictor of repeat ER use) or that behavior problems reflect more complexity of care that caregivers feel that they cannot deal with alone. This caregiver exhaustion and feelings of helplessness likely, ultimately, result in bringing the patient to the ER.<sup>41,42</sup> Indeed, other studies have shown that aggressive behavior in PWD has been associated with higher rates of nursing-home placements,<sup>43</sup> another way in which caregivers seek other sources of care.

In terms of caregiver characteristics as predictors, our study also showed relationship strain as a predictor of repeat ER utilization. Other studies have found that caregiver strain is influenced by the functional status of the patient not only in dementia<sup>44</sup> but also in other chronic conditions, such as stroke<sup>45</sup>; and this could also underlie the association we found between relationship strain and ER use. That is, as the PWD's ability to take care of him or herself declines, the caregiver increasingly has to manage and meet multiple needs that require more skill, economic resources, and time; overall, this likely strains the relationship and results in increased ER use. Moreover, several studies of caregivers in dementia have found that caregiver burden not only results in worse health outcomes for PWD but also expedites their placement in a nursing home.<sup>44,46,47</sup> Relationship strain as a predictor of repeat ER use could also, thus, be the result of a caregiver's desire to be relieved (even if only temporarily) of caregiver burden or feelings of helplessness and inability to deal with the PWD in a home environment.

Priority of enrollment has been shown elsewhere to affect service use.<sup>48</sup> Our analysis clearly differentiated among the highest (priority 1) grouping versus the middle priorities (priorities 2-6) in terms of the overall likelihood of ER use, with the lowest priority groups showing a reduced—but statistically nonsignificantly different—likelihood of ER use compared with the priority 1 veterans. Our 3 specific priority-level groupings were chosen to broadly capture variability in VA access,

with priority 1 veterans generally having no copays for VA services, substantially reducing the financial barriers to health care access. However, since veterans qualify for priority 1 status by having a medical disability that is at least 50% service connected or by being assigned a total disability rating for compensation based on unemployability, it is also plausible that their increased ER use reflects an increased level of need not captured by the personal care composite.

Caregiver demographics were insignificant in this study for predicting ER utilization. As to whether caregiver demographics influence relationship strain remains controversial; some studies of caregivers found that female caregivers were more distressed than male caregivers<sup>49,50</sup> and that younger caregivers felt more relationship and social isolation than older caregivers.<sup>50</sup> Other studies have found that demographics for caregivers of PWD do not matter,<sup>51,52</sup> and the findings of our study are consistent with this. Although we found that caregiver perception of relationship strain was significant for predicting the PWD's repeat admissions to the ER, we did not find any relationship between caregiver demographics and relationship strain.

There have been 2 systematic reviews of elderly patients' ER utilization. Multiple studies in both found that previous hospital or ER utilization was a statistically significant determinant<sup>3,14</sup>; our study did not look at previous health care service utilization as a risk factor. Both reviews also found that advanced age was a common risk factor in ER utilization, which our study did not find.<sup>3,14</sup> The review by McCusker et al noted that, in the multivariate analyses, age tended to become nonsignificant. In the review by Aminzadeh and Dalziel, the most common risk factor (seen in 7 of 10 studies reviewed) was functional dependence,<sup>3</sup> which is also the strongest predictor in our study. Other common risk factors included living alone (although McCusker et al concluded that there was conflicting evidence)<sup>14</sup> and lack of social support.<sup>3</sup> This review also found that perceived poor health status was a common risk factor, statistically significant in 4 of 10 studies.<sup>14</sup> This category included both comorbidities and impaired functional status; both were separate predictors in our study that also achieved statistical significance.

Although most of the literature supports need factors as the most important predictors of health service utilization, 1 study that examined PWD and caregiver characteristics as predictors of health service utilization found that enabling factors were the most important category.<sup>53</sup> However, the study by Toseland et al was different in at least 3 significant areas: (1) its study population had different health care access and barriers to service compared to our study's VA population; (2) enabling variables were aggregated into 1 category rather than examined individually; and (3) ER use was not a separate outcome measure. Further analysis is likely required to elucidate and corroborate the extent to which enabling factors actually predict health service use.

### Limitations

With a few exceptions, the overall demographics of our sample were comparable to those of other studies of PWD and elderly patients using the ER. The mean age of the PWD in this sample

was 78.6, which is slightly older than in other studies of elderly adults using the ER (72.8,<sup>54</sup> 74.5,<sup>55</sup> 76 mean age<sup>36</sup>) but comparable to studies examining PWD (78,<sup>26</sup> 78.9,<sup>47</sup> 79,<sup>56</sup> 79.2,<sup>57</sup> 79.3<sup>58</sup>). The mean number of chronic conditions was 4.6, similar to other studies of elderly PWD (4.1<sup>12</sup>).

Our caregiver demographics, too, were roughly comparable to those of other studies. The mean age of the caregiver was 68.8, which is only slightly older than the mean age of caregivers of PWD in other studies (61.9,<sup>58</sup> 64<sup>47</sup>). Most (96.3%) of the caregivers in our sample were women. This percentage is higher than, but similar to, the findings of other studies in which most caregivers for PWD were also women (77%,<sup>58</sup> 72%<sup>47</sup>).

Another possible limitation of our sample is that it is not representative regarding gender; 98.0% of the PWD were men. Other studies of elderly adults going to the ER still had a majority of men but a much smaller percentage (57.4%,<sup>54</sup> 64.6%<sup>55</sup>), while studies of PWD show men to be in the minority (men made up 27%,<sup>59</sup> 44%,<sup>26</sup> 41%,<sup>56</sup> 39%,<sup>58</sup>, 40.7%<sup>57</sup> in other studies<sup>57</sup>). Because there are many more women than men who are PWDs in an aging society,<sup>60-63</sup> women's patterns of ER utilization shape the general population's overall picture. In contrast, this sample drawn from veterans was overwhelmingly made up of men. Women and men have different patterns of health care utilization—elderly women are more likely to use long-term supportive resources (eg, home health care) rather than acute facilities (eg, hospital and physician visits),<sup>60,64</sup> so this may be a skewed picture of PWDs' use of the ER.

## Conclusion

Based on these results, targeting interventions at a PWD's ability to care for himself or herself seems key to reducing ER utilization. Several home-based ADL interventions for older adults have been tested and found to be both beneficial for the patient and cost effective<sup>65,66</sup>; although, to our knowledge, no studies have looked at whether these interventions reduce health service use. Indeed, a systematic review of elderly patients' ER utilization has noted a dearth of studies that examine the effect of proactive health interventions on preventing the need for ER care.<sup>4</sup>

Advancing Better Living for Elders is 1 such intervention that involves 5 occupational therapy (OT) sessions and 1 physical therapy home visit. Occupational therapy worked with the patient to identify functional difficulties, modify the environment, promote safety, and minimize ADL difficulties. Physical therapy helped strengthen muscles and balance, teach fall-recovery techniques, and refer for additional therapy.<sup>65</sup> Advancing Better Living for Elders resulted in reduced functional difficulties, enhanced home safety, and self-efficacy in managing daily activities, and reduced mortality at 12 and 24 months.<sup>66</sup>

Another intervention, the Tailored Activity Program (TAP), includes 8 sessions of OT to preserve patients' ADLs, habits, and interests, as well as train families. The TAP saved caregivers, on average, 2 hours a day of caregiving.<sup>66</sup> An intervention like TAP would, thus, not only target the personal care abilities of PWD

but also aim to reduce the relationship strain between caregiver and PWD.

Because the PWD's behavior problems were also trending toward significance in predicting repeat ER admissions, this represents another area of possible intervention. A recent meta-analysis of nonpharmacologic interventions targeting behavior problems in PWD concluded that the most effective interventions are tailored to the needs of PWD and caregiver in the home.<sup>67</sup> These were successful in lessening behavior problems, such as agitation, aggression, and disruption, as well as effectively decreasing caregiver strain,<sup>67</sup> which was another predictor of ER utilization in our study. Theoretically, then, these could effectively target multiple risk factors of ER utilization in PWD.

Finally, as few ERs currently screen for or are equipped to address functional impairment,<sup>6</sup> this reinforces the inadequacy of the ER as a health care setting for meeting PWDs' needs. Number of chronic conditions and caregiver-reported relationship strain were predictors of repeat ER use, which could be important issues to be addressed by social workers involved in the discharge process of PWDs prevent readmissions.

## Authors' Note

The views expressed are those of the authors and do not necessarily reflect the position or policy of the Department of Veterans Affairs, the US government or Baylor College of Medicine.

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## References

1. Samaras N, Chevalley T, Samaras D, Gold G. Older patients in the emergency department: a review. *Ann Emerg Med.* 2010; 56(3):261-269.
2. CDC. *National Hospital Ambulatory Medical Care Survey: Fact-sheet, Emergency Department.* [http://www.cdc.gov/nchs/data/ahcd/NHAMCS\\_Factsheet\\_ED\\_2009.pdf](http://www.cdc.gov/nchs/data/ahcd/NHAMCS_Factsheet_ED_2009.pdf). Accessed 21st October 2013.
3. Aminzadeh F, Dalziel WB. Older adults in the emergency department: a systematic review of patterns of use, adverse outcomes, and effectiveness of interventions. *Ann Emerg Med.* 2002;39(3): 238-247.
4. Gruneir A, Silver MJ, Rochon PA. Emergency department use by older adults: a literature review on trends, appropriateness, and consequences of unmet health care needs. *Med Care Res Rev.* 2011;68(2):131-155. doi:10.1177/1077558710379422.

5. US Government Accountability Office. *Hospital Emergency Departments: Health Center Strategies That May Help Reduce Their Use*. <http://www.gao.gov/products/GAO-11-643T>. Accessed January 14, 2013.
6. Carpenter CR, Platts-Mills TF. Evolving prehospital, emergency department, and “inpatient” management models for geriatric emergencies. *Clin Geriatr Med*. 2013;29(1):31-47. doi:10.1016/j.cger.2012.09.003.
7. Peterson L-KN, Fairbanks RJ, Hettinger AZ, Shah MN. Emergency medical service attitudes toward geriatric prehospital care and continuing medical education in geriatrics. *J Am Geriatr Soc*. 2009;57(3):530-535. doi:10.1111/j.1532-5415.2008.02108.x.
8. Schumacher JG, Deimling GT, Meldon S, Woolard B. Older adults in the emergency department: predicting physicians’ burden levels. *J Emerg Med*. 2006;30(4):455-460. doi:10.1016/j.jemermed.2005.07.008.
9. Robinson S, Mercer S. Older adult care in the emergency department: identifying strategies that foster best practice. *J Gerontol Nurs*. 2007;33(7):40-47.
10. Gutterman EM, Markowitz JS, Lewis B, Fillit H. Cost of Alzheimer’s disease and related dementia in managed-medicare. *J Am Geriatr Soc*. 1999;47(9):1065-1071.
11. Bejjani C, Snow AL, Judge KS, et al. Characteristics of depressed caregivers of veterans with dementia [published online October 14, 2012]. *Am J Alzheimers Dis Other Dement*. 2012. doi:10.1177/1533317512461555.
12. Lyketsos CG, Toone L, Tschanz J, et al. Population-based study of medical comorbidity in early dementia and “cognitive impairment, no dementia (CIND)”: association with functional and cognitive impairment: the Cache County Study. *Am J Geriatr Psychiatry*. 2005;13(8):656-664. doi:10.1176/appi.ajgp.13.8.656.
13. Beekmann M, van den Bussche H, Glaeske G, Hoffmann F. Geriatric morbidity patterns and need for long-term care in patients with dementia. *Psychiatr Prax*. 2012;39(5):222-227. doi:10.1055/s-0032-1305010.
14. McCusker J, Karp I, Cardin S, Durand P, Morin J. Determinants of emergency department visits by older adults: a systematic review. *Acad Emerg Med*. 2003;10(12):1362-1370.
15. Odom SR, Barone JE, Docimo S, Bull SM, Jorgensson D. Emergency department visits by demented patients with malfunctioning feeding tubes. *Surg Endosc*. 2003;17(4):651-653. doi:10.1007/s00464-002-8599-y.
16. Tian H, Abouzaid S, Sabbagh MN, et al. Health care utilization and costs among patients with AD with and without dysphagia. *Alzheimer Dis Associated Disord*. 2013;27(2):138-144. doi:10.1097/WAD.0b013e318258cd7d.
17. Judge KS, Bass DM, Snow AL, et al. Partners in Dementia Care: a care coordination intervention for individuals with dementia and their family caregivers. *Gerontologist*. 2011;51(2):261-272. doi:10.1093/geront/gnq097.
18. Stroupe KT, Smith BM, Lee TA, et al. Effect of increased copayments on pharmacy use in the Department of Veterans Affairs. *Med Care*. 2007;45(11):1090-1097. doi:10.1097/MLR.0b013e3180ca95be.
19. Bass DM, Judge KS, Snow AL, et al. Negative caregiving effects among caregivers of veterans with dementia. *Am J Geriatr Psychiatry*. 2012;20(3):239-247. doi:10.1097/JGP.0b013e31824108ca.
20. Pearlin LI, Mullan JT, Semple SJ, Skaff MM. Caregiving and the stress process: an overview of concepts and their measures. *Gerontologist*. 1990;30(5):583-594. doi:10.1093/geront/30.5.583.
21. Bass DM, Clark PA, Looman WJ, McCarthy CA, Eckert S. The Cleveland Alzheimer’s Managed Care Demonstration: outcomes after 12 months of implementation. *Gerontologist*. 2003;43(1):73-85.
22. Al Snih S, Markides KS, Ray LA, Freeman JL, Ostir GV, Goodwin JS. Predictors of healthcare utilization among older Mexican Americans. *Ethn Dis*. 2006;16(3):640-646.
23. Quail JM, Wolfson C, Lippman A. Unmet need and psychological distress predict emergency department visits in community-dwelling elderly women: a prospective cohort study. *BMC Geriatr*. 2011;11:86. doi:10.1186/1471-2318-11-86.
24. Sandberg M, Kristensson J, Midlöv P, Fagerström C, Jakobsson U. Prevalence and predictors of healthcare utilization among older people (60+): focusing on ADL dependency and risk of depression. *Arch Gerontol Geriatr*. 2012;54(3): e349-e363. doi:10.1016/j.archger.2012.02.006.
25. Gustavsson A, Brinck P, Bergvall N, et al. Predictors of costs of care in Alzheimer’s disease: a multinational sample of 1222 patients. *Alzheimers Dement*. 2011;7(3):318-327. doi:10.1016/j.jalz.2010.09.001.
26. Vargas AP, Carod-Artal FJ, Nunes SV, Melo M. Disability and use of healthcare resources in Brazilian patients with Parkinson’s disease. *Disabil Rehabil*. 2008;30(14):1055-1062.
27. Claesson L, Lindén T, Skoog I, Blomstrand C. Cognitive impairment after stroke - impact on activities of daily living and costs of care for elderly people. The Göteborg 70+ Stroke Study. *Cerebrovasc Dis*. 2005;19(2):102-109. doi:10.1159/000082787.
28. Rowland K, Maitra AK, Richardson DA, Hudson K, Woodhouse KW. The discharge of elderly patients from an accident and emergency department: functional changes and risk of readmission. *Age Ageing*. 1990;19(6):415-418.
29. Shah MN, Rathouz PJ, Chin MH. Emergency department utilization by noninstitutionalized elders. *Acad Emerg Med*. 2001;8(3):267-273.
30. McCusker J, Healey E, Bellavance F, Connolly B. Predictors of repeat emergency department visits by elders. *Acad Emerg Med*. 1997;4(6):581-588.
31. Fleischman RJ, McConnell KJ, Adams AL, Hedges JR, Newgard CD. Injury as a marker for emergency medical services use in Medicare patients. *Prehosp Emerg Care*. 2010;14(4):425-432. doi:10.3109/10903127.2010.493986.
32. Northridge ME, Nevitt MC, Kelsey JL, Link B. Home hazards and falls in the elderly: the role of health and functional status. *Am J Public Health*. 1995;85(4):509-515.
33. Vanpee D, Swine C, Vandenbossche P, Gillet JB. Epidemiological profile of geriatric patients admitted to the emergency department of a university hospital localized in a rural area. *Eur J Emerg Med*. 2001;8(4):301-304.



34. Roussel-Laudrin S, Paillaud E, Alonso E, et al. The establishment of geriatric intervention group and geriatric assessment at emergency of Henri-Mondor hospital. *Rev Med Interne*. 2005;26(6):458-466. doi:10.1016/j.revmed.2005.03.004.
35. Shah MN, Glushak C, Karrison TG, et al. Predictors of emergency medical services utilization by elders. *Acad Emerg Med*. 2003;10(1):52-58.
36. Wilber ST, Blanda M, Gerson LW. Does functional decline prompt emergency department visits and admission in older patients? *Acad Emerg Med*. 2006;13(6):680-682. doi:10.1197/j.aem.2006.01.006.
37. Zekry D, Herrmann FR, Grandjean R, et al. Demented versus non-demented very old inpatients: the same comorbidities but poorer functional and nutritional status. *Age Ageing*. 2008;37(1):83-89. doi:10.1093/ageing/afm132.
38. Kunik ME, Snow AL, Molinari VA, et al. Health care utilization in dementia patients with psychiatric comorbidity. *Gerontologist*. 2003;43(1):86-91. doi:10.1093/geront/43.1.86.
39. Murman DL, Chen Q, Powell MC, Kuo SB, Bradley CJ, Colenda CC. The incremental direct costs associated with behavioral symptoms in AD. *Neurology*. 2002;59(11):1721-1729. doi:10.1212/01.WNL.0000036904.73393.E4.
40. Bartels SJ, Horn SD, Smout RJ, et al. Agitation and depression in frail nursing home elderly patients with dementia: treatment characteristics and service use. *Am J Geriatr Psychiatry*. 2003;11(2):231-238.
41. Nguyen VT, Love AR, Kunik ME. Preventing aggression in persons with dementia. *Geriatrics*. 2008;63(11):21-26.
42. Tueth MJ. Diagnosing psychiatric emergencies in the elderly. *Am J Emerg Med*. 1994;12(3):364-369.
43. Kunik ME, Snow AL, Davila JA, et al. Consequences of aggressive behavior in patients with dementia. *J Neuropsychiatry Clin Neurosci*. 2010;22(1):40-47. doi:10.1176/appi.neuropsych.22.1.40.
44. Gaugler JE, Kane RL, Kane RA, Newcomer R. Unmet care needs and key outcomes in dementia. *J Am Geriatr Soc*. 2005;53(12):2098-2105. doi:10.1111/j.1532-5415.2005.00495.x.
45. Nelson MM, Smith MA, Martinson BC, Kind A, Luepker RV. Declining patient functioning and caregiver burden/health: the Minnesota Stroke Survey—Quality of Life After Stroke Study. *Gerontologist*. 2008;48(5):573-583. doi:10.1093/geront/48.5.573.
46. Andrén S, Elmståhl S. Effective psychosocial intervention for family caregivers lengthens time elapsed before nursing home placement of individuals with dementia: a five-year follow-up study. *Int Psychogeriatr*. 2008;20(6):1177-1192. doi:10.1017/S1041610208007503.
47. Yaffe K, Fox P, Newcomer R, et al. Patient and caregiver characteristics and nursing home placement in patients with dementia. *JAMA*. 2002;287(16):2090-2097.
48. Morgan R, Petersen LA, Hasche JC, et al. VA pharmacy use in veterans with Medicare drug coverage. *Am J Manag Care*. 2009;15(3):e1-e8.
49. Almborg B, Jansson W, Grafström M, Winblad B. Differences between and within genders in caregiving strain: a comparison between caregivers of demented and non-caregivers of non-demented elderly people. *J Adv Nurs*. 1998;28(4):849-858.
50. Fitting M, Rabins P, Lucas MJ, Eastham J. Caregivers for dementia patients: a comparison of husbands and wives. *Gerontologist*. 1986;26(3):248-252. doi:10.1093/geront/26.3.248.
51. Chumbler NR, Grimm JW, Cody M, Beck C. Gender, kinship and caregiver burden: the case of community-dwelling memory impaired seniors. *Int J Geriatr Psychiatry*. 2003;18(8):722-732. doi:10.1002/gps.912.
52. Annerstedt L, Elmståhl S, Ingvad B, Samuelsson SM. Family caregiving in dementia—an analysis of the caregiver's burden and the "breaking-point" when home care becomes inadequate. *Scand J Public Health*. 2000;28(1):23-31.
53. Toseland RW, McCallion P, Gerber T, Banks S. Predictors of health and human services use by persons with dementia and their family caregivers. *Soc Sci Med*. 2002;55(7):1255-1266. doi:10.1016/S0277-9536(01)00240-4.
54. Lim KH, Yap KB. The presentation of elderly people at an emergency department in Singapore. *Singapore Med J*. 1999;40(12):742-744.
55. Hu SC, Yen D, Yu YC, Kao WF, Wang LM. Elderly use of the ED in an Asian metropolis. *Am J Emerg Med*. 1999;17(1):95-99. doi:10.1016/S0735-6757(99)90029-3.
56. Covinsky KE, Newcomer R, Fox P, et al. Patient and caregiver characteristics associated with depression in caregivers of patients with dementia. *J Gen Intern Med*. 2003;18(12):1006-1014. doi:10.1111/j.1525-1497.2003.30103.x.
57. Calvo-Perxas L, Osuna MT, Gich J, et al. Clinical and demographic characteristics of the cases of dementia diagnosed in the Health District of Girona throughout the period 2007-2010: data from the Girona Dementia Registry (ReDeGi). *Rev Neurol*. 2012;54(7):399-406.
58. Gitlin LN, Roth DL, Burgio LD, et al. Caregiver appraisals of functional dependence in individuals with dementia and associated caregiver upset psychometric properties of a new scale and response patterns by caregiver and care recipient characteristics. *J Aging Health*. 2005;17(2):148-171. doi:10.1177/0898264304274184.
59. Toseland RW, McCallion P, Gerber T, Banks S. Predictors of health and human services use by persons with dementia and their family caregivers. *Soc Sci Med*. 2002;55(7):1255-1266.
60. Schwarzkopf L, Menn P, Leidl R, et al. Excess costs of dementia disorders and the role of age and gender - an analysis of German health and long-term care insurance claims data. *BMC Health Serv Res*. 2012;12(1):165. doi:10.1186/1472-6963-12-165.
61. Schmidt R, Kienbacher E, Benke T, et al. Sex differences in Alzheimer's disease. *Neuropsychiatr*. 2008;22(1):1-15.
62. Plassman BL, Langa KM, Fisher GG, et al. Prevalence of dementia in the United States: the Aging, Demographics, and Memory Study. *Neuroepidemiology*. 2007;29(1-2):125-132. doi:10.1159/000109998.
63. Hebert LE, Scherr PA, Bienias JL, Bennett DA, Evans DA. Alzheimer disease in the US population: prevalence estimates using the 2000 census. *Arch Neurol*. 2003;60(8):1119-1122. doi:10.1001/archneur.60.8.1119.
64. Cameron KA, Song J, Manheim LM, Dunlop DD. Gender disparities in health and healthcare use among older adults. *J Womens Health (Larchmt)*. 2010;19(9):1643-1650. doi:10.1089/jwh.2009.1701.

65. Jutkowitz E, Gitlin LN, Pizzi LT, Lee E, Dennis MP. Cost effectiveness of a home-based intervention that helps functionally vulnerable older adults age in place at home. *J Aging Res.* 2012;2012. doi:10.1155/2012/680265.
66. Gitlin LN, Hodgson N, Jutkowitz E, Pizzi L. The cost-effectiveness of a nonpharmacologic intervention for individuals with dementia and family caregivers: the Tailored Activity Program. *Am J Geriatr Psychiatry.* 2009;1. doi:10.1097/JGP.0b013e3181c37d13.
67. Brodaty H, Arasaratnam C. Meta-analysis of nonpharmacological interventions for neuropsychiatric symptoms of dementia. *Am J Psychiatry.* 2012;169(9):946-953. doi:10.1176/appi.ajp.2012.11101529.